

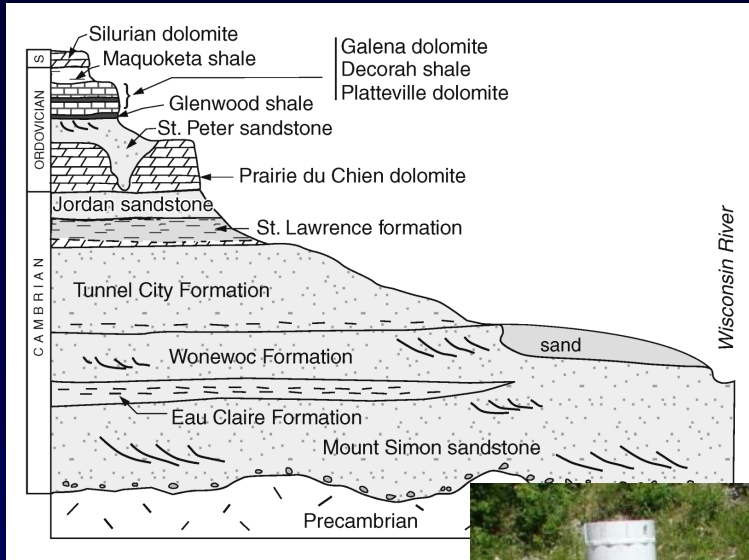
Groundwater and Geology of Southwest Wisconsin

Paul Ohlrogge

UW-Extension Iowa County



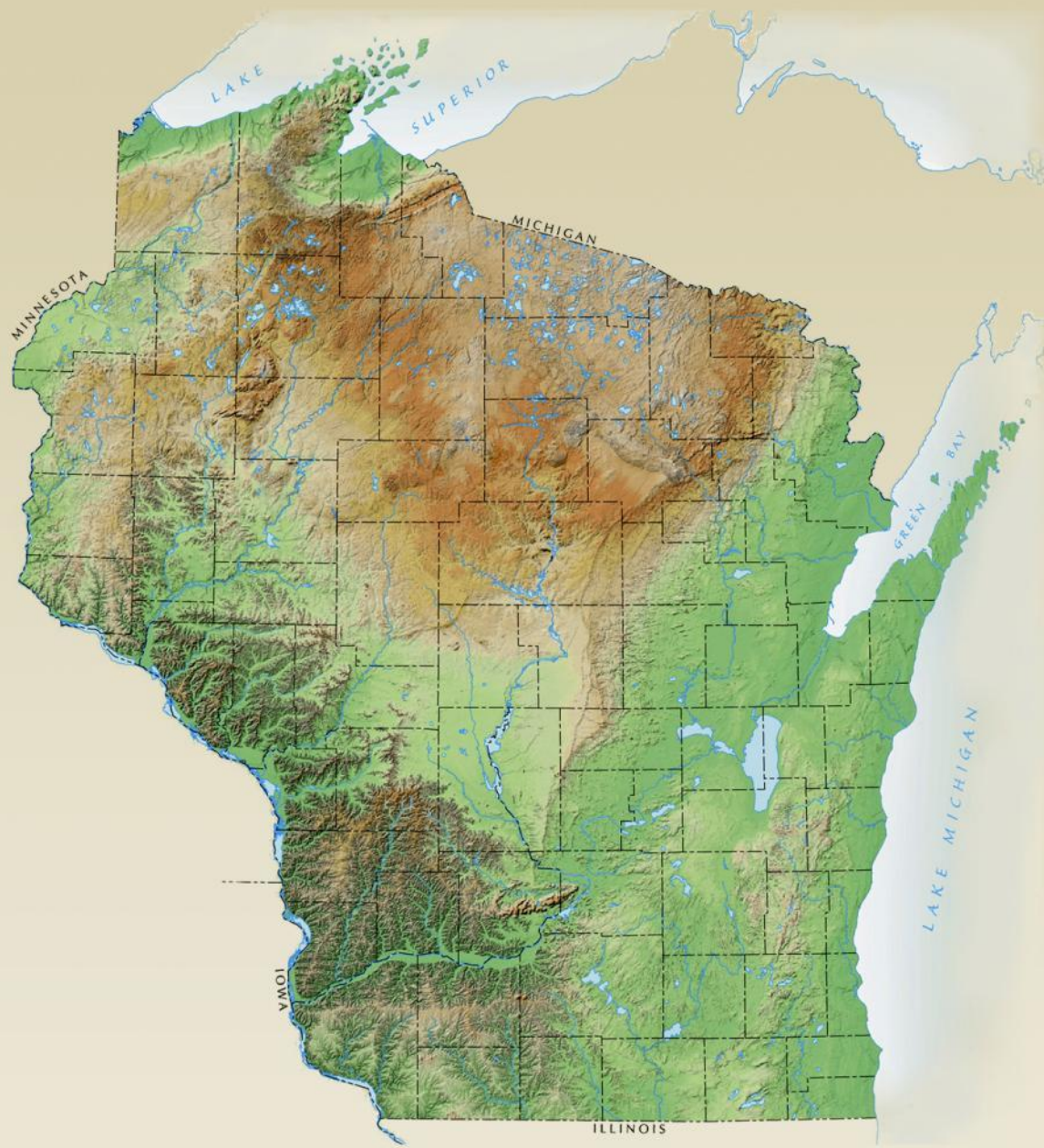
This presentation describes southwest Wisconsin's geology and its groundwater resources.



Geology



Groundwater quantity and quality





Discretionary Deposits

Wisconsin River lowlands in northern part of Iowa County. Deposits occur all in
in thickness and overlie un lithomiated Cambrian sandstone.

- | | |
|---|--|
|  | Windblown sand. Typically more than 1.5 m thick in these streams and windblown sand occurs over much of the surface of units a and d. |
|  | Moderate stream sediment. Primarily sand or slightly gravelly sand on modern river bottoms, most deposited during last part of the Wisconsinan glaciation; by this point, the stream has been in its present place, includes some perpendicular valley-side bars of fluvial and slope sediment. |
|  | Stream sediment of Elderon Phase. Sand and gravelly sand deposited by the Wisconsinan carrying outwash from the Green Bay lobe, during the Elderon Phase of glaciation and by floodwater during draining of Glacial Lake Wisconsin; occurs on terraces below the Johnsonan terrace. |
|  | Younger proglacial, nonglacial stream sediment. Primarily sand or slightly gravelly sand, typically several meters thick, most deposited during early part of the Johnsonan or during the last part of the Wisconsinan glaciation; commonly occurs on fans or at gravelly sand along modern fluvial channels, including some of the type 2 and 3. |
|  | Stream sediment of Johnsonian Phase. Sand and gravelly sand deposited by braided streams that carried meltwater from the Green Bay lobe during the Johnsonan Phase of glaciation; occurs as a high terrace. |

Polymeric bedrock units.

- | | |
|----|--|
| 10 | Vishnu Series , <i>Sitkotede</i> , <i>delimitation</i> of <i>Sitkotede</i> age. Thought to originate from alteration of limestone containing volatiles (shells) by leaching and weathering. Only present under West Mt. Shasta in western Kern County. |
| 9 | Mangatake Formation , Blue-gray dolomite shale with occasional thin gray dolomite lenses. Only present under West Mt. Shasta in central Kern County. |
| 8 | Galena Formation (<i>Shimnipee Group</i>). Light yellowish-gray to brown dolomite and dolomite limestone with some yellow-gray shale parts. Contains coarse granular to crystalline dolomite. In some parts, dolomite is thick bedded. Laterally extensive chert beds in lower parts of the formation. |
| 7 | Donsora Formation (<i>Shimnipee Group</i>). Dark gray and blue dolomite limestone and olive-gray to brown shale beds. Overall thin with some wavy bedding, about 30 to 35 ft thick. |
| 6 | Platteville Formation (<i>Shimnipee Group</i>). Generally fine-grained light-gray dolomite. Sometimes dolomite becoming sandy near base. Upper gray shale part generally thin. Dolomite is massive to thin bedded. Limestone is brownish to tan and medians to thick bedded. Some parts are quite fossiliferous. |
| 5 | Arnold Group (St. Peter Formation). Base: Roubidoux Member is a micaceous dolomite, thick, shaly, and dolomite sandstone. Thickens to a relatively variable, thin, mainly to medium-bedded, chert. Overlain by Tule member. Which in turn, is medium-grained well-sorted sandstone. The basal 100 ft of the Arnold Group is a massive, gray to olive color. Generally poorly cemented. Overlain by the Glasswood Member, a dolomite, poorly cemented sandstone to sandy dolomite with dark gray green to green. Glasswood Member is a massive, gray to olive, generally less than 1.5 ft thick. Arnold Group is deposited on major unconformity and ranges from 7 ft over 100 ft thick. |
| 4 | Frederic de Chien Group (<i>Obliquepore and Onusta Formations</i>). Light brown to yellow to light reddish brown dolomite, sandy dolomite, and dolomite sandstone. Commonly horizontal with certain thin tilted with dark brown to red and clay weathered. Locally yellow, oolitic, and cherty areas in irregular beds. Contact with overlying Arnold Canyon is very irregular. |
| 3 | Jordan Formation . White, brown, to red-brown, fine to coarse-grained quartzite sandstone. Fine-grained parts of formation often homogeneously to tough even-textured. |
| 2 | La Lawrence Formation . Light yellow-brown fine-grained dolomite, dolomite sandstone, and dolomite and shale beds. Generally fine-bedded. |
| 1 | Tanzer City Formation . Light brown to distinct glauconitic (green) fine-grained sandstone with green-gray shale partings. Commonly cross-stratified and extensively deformed by burrowing organisms. |
| 0 | Sierraville Formation . Light brown fine to coarse-grained quartzite sandstone. Though cross-stratification common. Contacts with overlying and underlying units are irregular. |

Synonyms

- Geological contacts, dashed where approximate
 — Stream-cut bank
 * Ice-wedge polygon

This may represent work performed by the Wisconsin Geological and Natural History Survey and is released to the open file in the interest of making the information readily available. This may not have edited or reviewed for conformity with Wisconsin Geological and Natural History Survey standards and nomenclature.

This map is part of an ongoing project funded by STOTMAP, the main component of the National Geospatial Geographic Mapping Program of the U.S. Geological Survey.

Wisconsin Geological and Natural History Survey
Open-File Report 2011-01

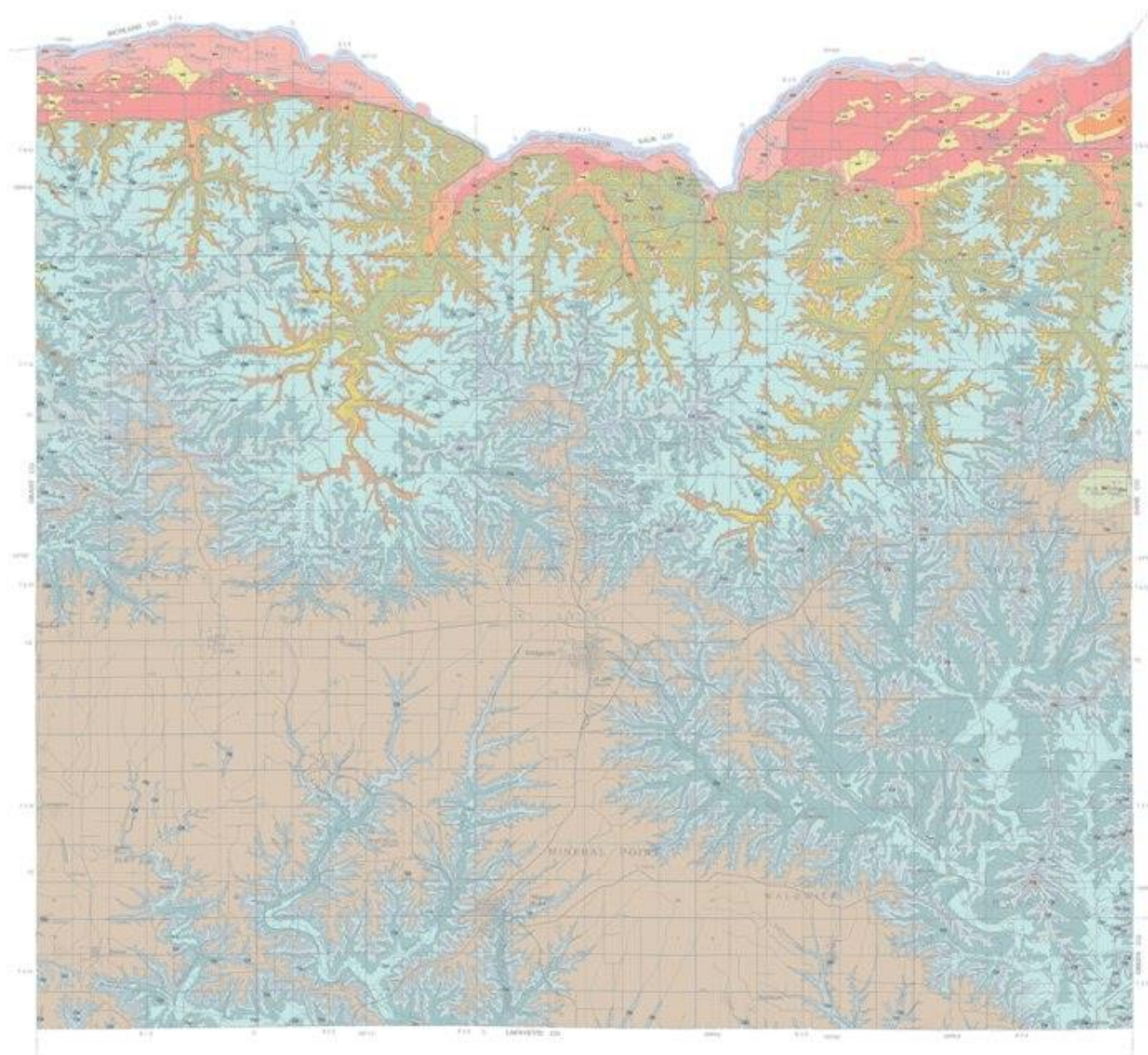


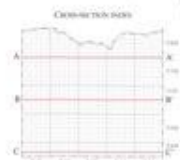
PLATE 1. PRELIMINARY GEOLOGIC MAP OF IOWA COUNTY, WISCONSIN.



Extension

Wisconsin Geological and Natural History Survey
3817 Mineral Point Road, Madison, Wisconsin 53705-5080
608/261-7800 • fax 608/261-6886
wisconsin.gns.wisc.edu

James M. Robertson, Director and State Cartographer
Cartography by D.E. Patterson.



EXPLANATION

Quaternary deposits

Wisconsin River terrace levels in northern part of Iowa County. Deposits exceed 60' in thickness and consist of undifferentiated Cretaceous sandstone.

Modern stream sediment. Primarily sand or slightly gravelly sand in modern valley bottoms; more deposited during last part of the Holocene; overlain by thin part of the clayey overbank sediment in many places. Includes some premodern valley side-lobe of fluvial and slope sediment.

Paleozoic bedrock units

Galena Formation of Stensliep Group. Thin yellowish-gray to brown dolomite and dolomite limestone with some yellow-gray shale partings. Generally granular to crystalline, moderately vuggy to microporous. Moderate to thick bedded. Laterally extensive, often beds to lower parts of the formation.

Danesh Formation of Stensliep Group. Dark gray to blue argillaceous limestone and olive green to brown shale beds. Locally thin with some wavy bedding, about 1' in thick.

Platteville Formation of Stensliep Group. Generally fine-grained light gray dolomite. Somewhat argillaceous becoming sandy near base. Upper part of formation generally thin and wavy bedded, lower part is heavier and medium to thick bedded. Somewhat more bedded than Galena Formation.

Assault Group (St. Peter Formation). Basal Roubidoux Member is a mixture of sandstone, chert, shale, and dolomite sandstone. Fairly variable thickness from about 1' to more than 40' in thick. Overlain by Sand Member which is fine to medium-grained, well-sorted sandstone with occasional thin green shale layers. White, red, to yellow. Generally poorly cemented. Overlain by the Glenwood Member, a fine to medium-grained sandstone to sandy dolomite with thin dark green shale layers. Glenwood Member absent in some areas and generally less than 1' in thick. Assault Group deposited on major erosion unconformity and ranges from 1' to more than 40' in thick.

Point de Chene Group (Shokopee and Onondaga Formations). Light brown to yellow to light reddish-brown dolomite, sandy dolomite, and dolomite sandstone. Commonly bedded, sandy surface filled with dark brown to red silt and clay sediment. Locally vuggy, and cherty zones or irregular beds. Contact with underlying Assault Group is very irregular.

Jordan Formation. White, brown, to red-brown fine to coarse-grained quartzite sandstone. Fine-grained parts of formation can be nonconformable to trough cross-bedded.

St. Lawrence Formation. Light yellow-brown fine-grained dolomite sandstone, siltstone, and some thin shale beds. Generally thin-bedded.

Town City Formation. Light brown to olive-green argillaceous green fine-grained sandstone with green gray shale partings. Commonly cross-bedded and laterally bedded.

Waukena Formation. Light brown fine to coarse-grained quartzite sandstone. Tough cross-bedded beds common. Contacts with overlying and underlying units are gradational.

East Chute Formation. Light to dark gray shale. Occasional thin beds of very fine to fine-grained dolomite sandstone and dolomite. Sand fragments and trace of pyrite throughout the shale. Sandstone and dolomite are locally slightly greenish. Based on limited field data, sandstone beds appear to increase in thickness in northeastern part of the county.

Muskegon Formation. Fine to coarse-grained sandstone. Mostly light gray or light brown. Dolomite cement, occasionally very well cemented. Some dark brown sandy dolomite beds occur at varying intervals and thicknesses. Traces of fine white silt, pyrite, and gray shale throughout units with

SYMBOLS

Approximate location of wells used to compile sections.

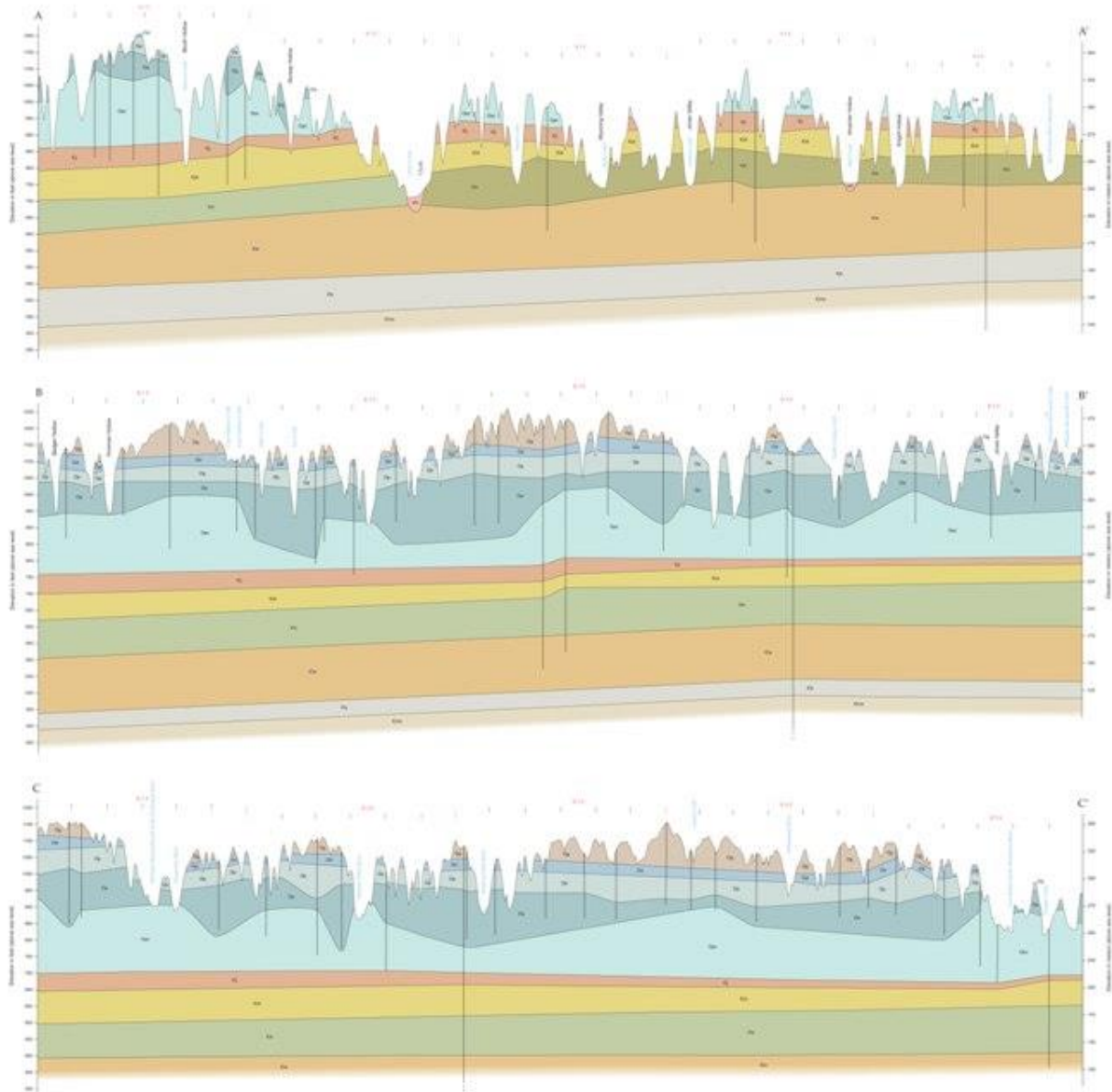
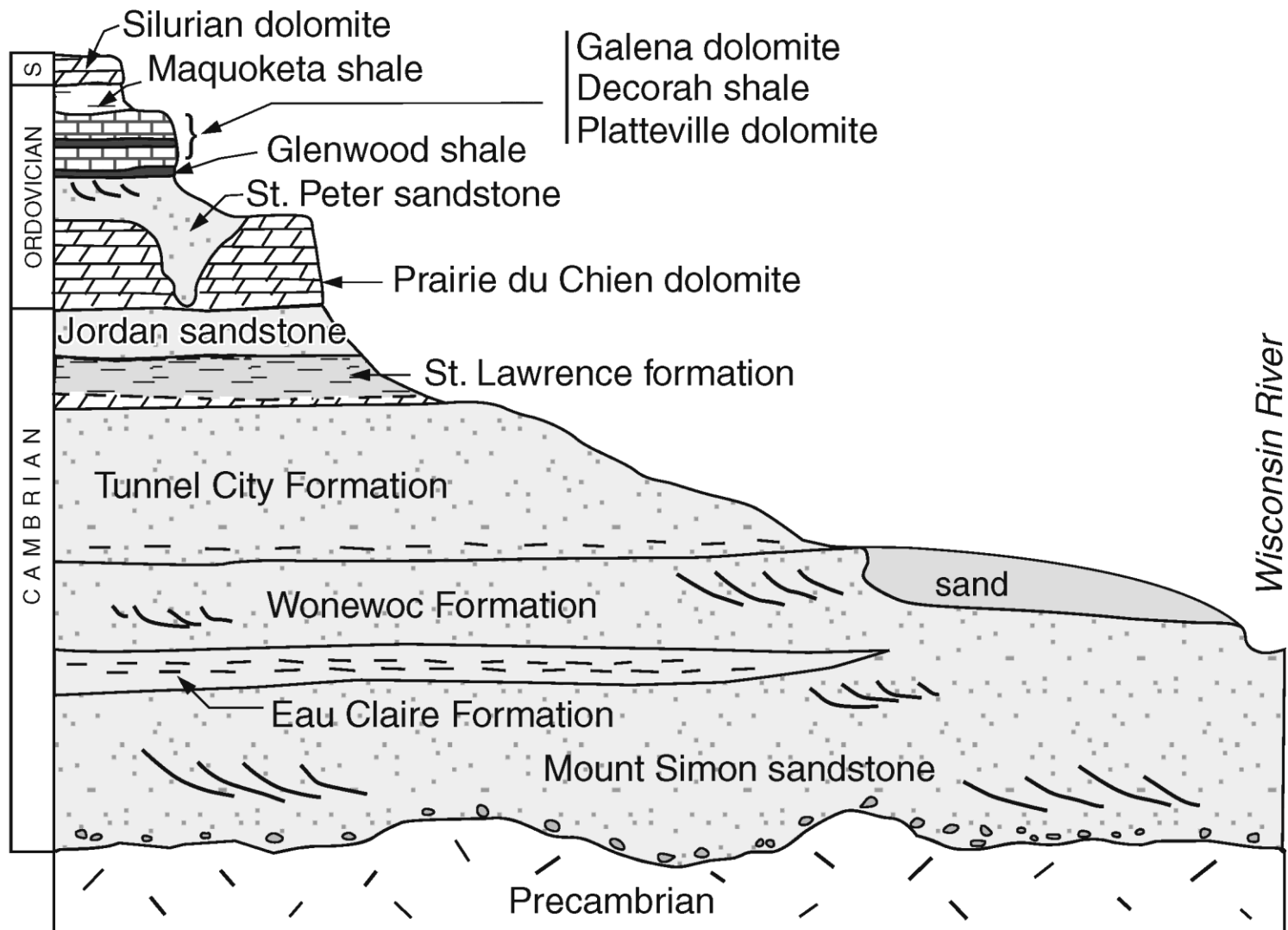


PLATE 2. PRELIMINARY GEOLOGIC CROSS SECTIONS OF IOWA COUNTY, WISCONSIN.

These cross sections represent data prepared by the Wisconsin Geological and Natural History Survey and are intended to be used only in the context of making the information readily available. These cross sections were not field data or intended to be used as a basis for any other geological or geophysical work. The Wisconsin Geological and Natural History Survey assumes no liability for any use of the information other than that intended.

This cross section is part of the ongoing project funded by the Wisconsin Geological and Natural History Survey, which is a part of the Wisconsin Geological and Natural History Survey's ongoing project of the U.S. Geological Survey.





ROAD CUT IN SINNIPEE GROUP, HWY 151 IOWA CO.









Groundwater in southwest Wisconsin...

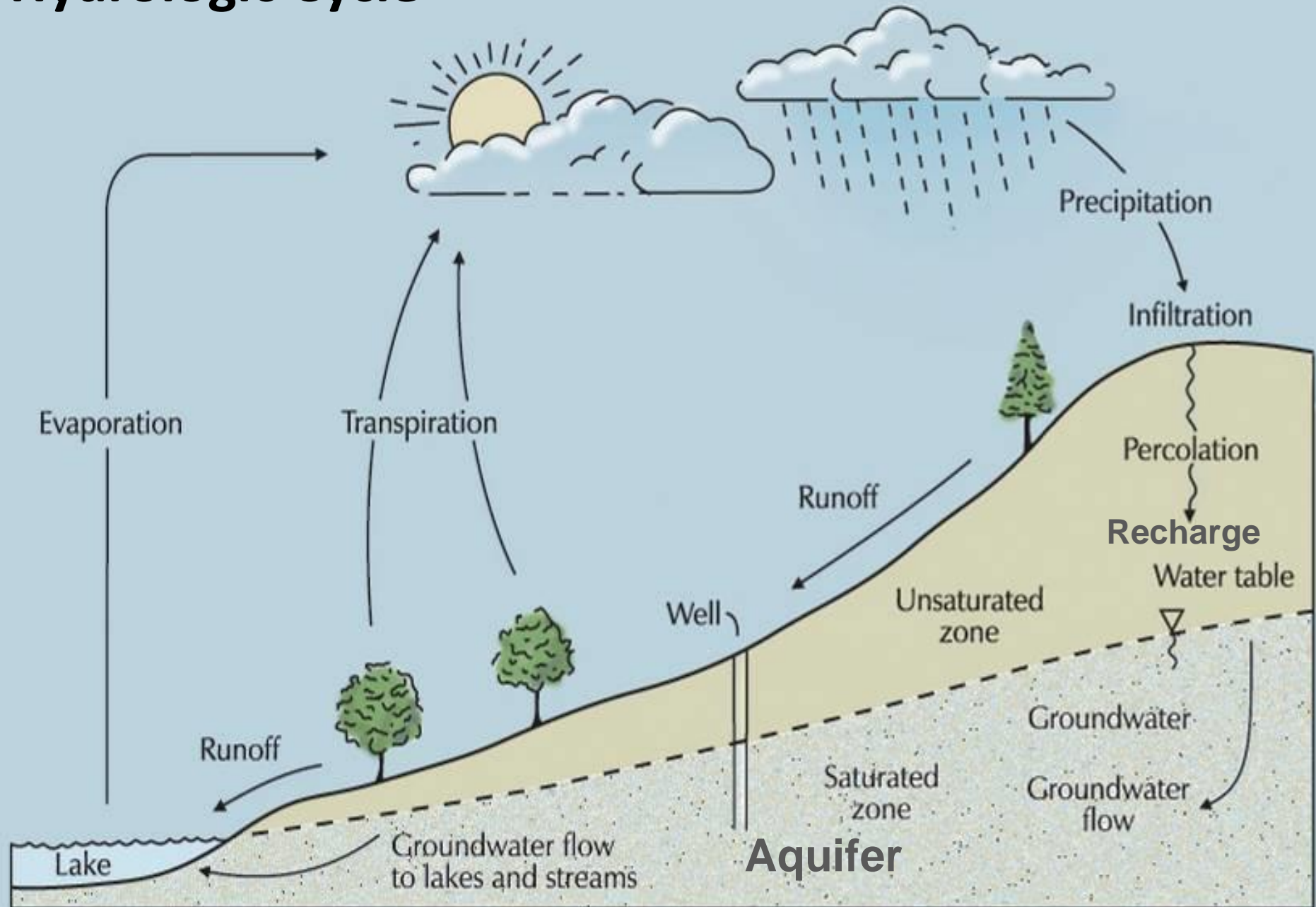
...provides drinking water.



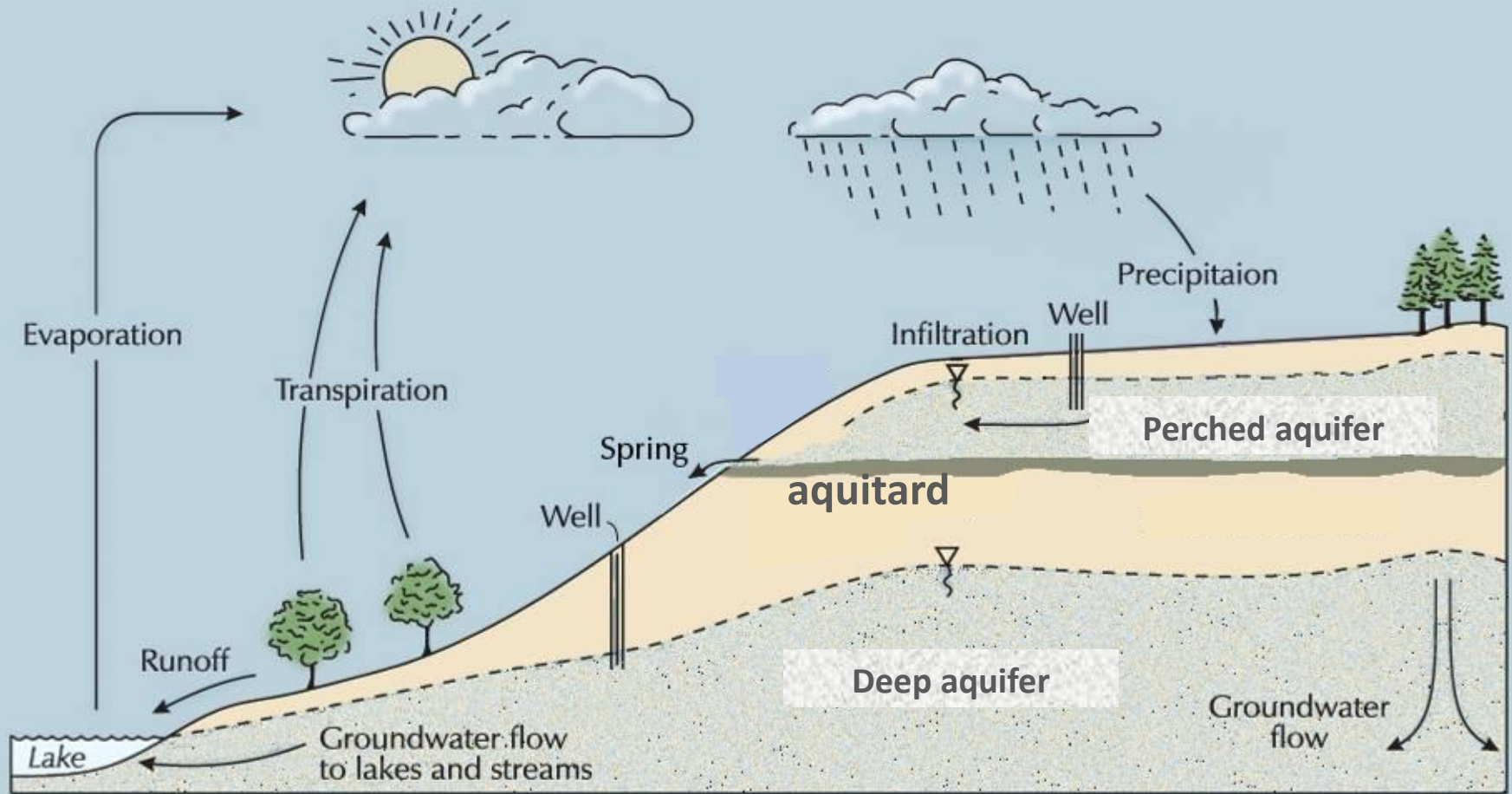
... sustains the
environment, the economy,
and our quality of life.



Hydrologic Cycle



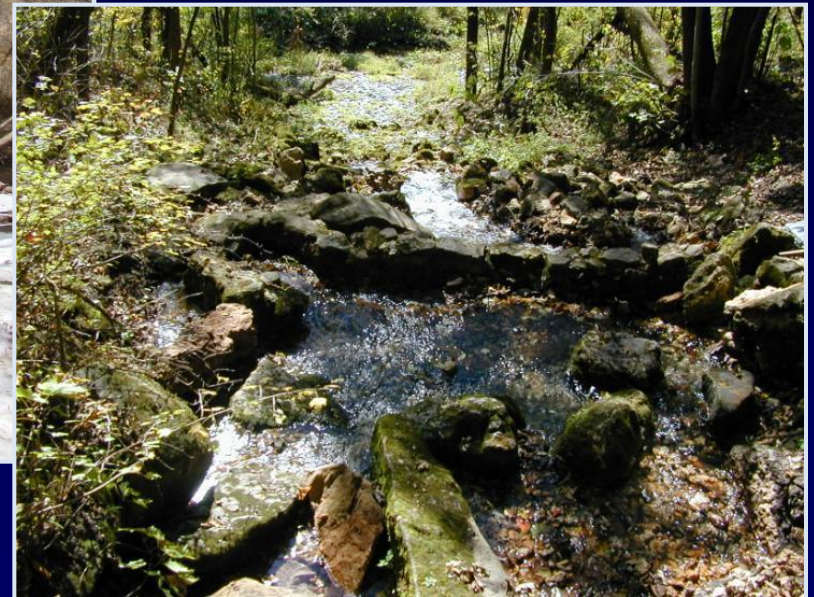
The hydrologic cycle in the Driftless Area is more complex due to extensive *aquitards*.



Groundwater discharge sustains baseflow to streams and springs year-round.

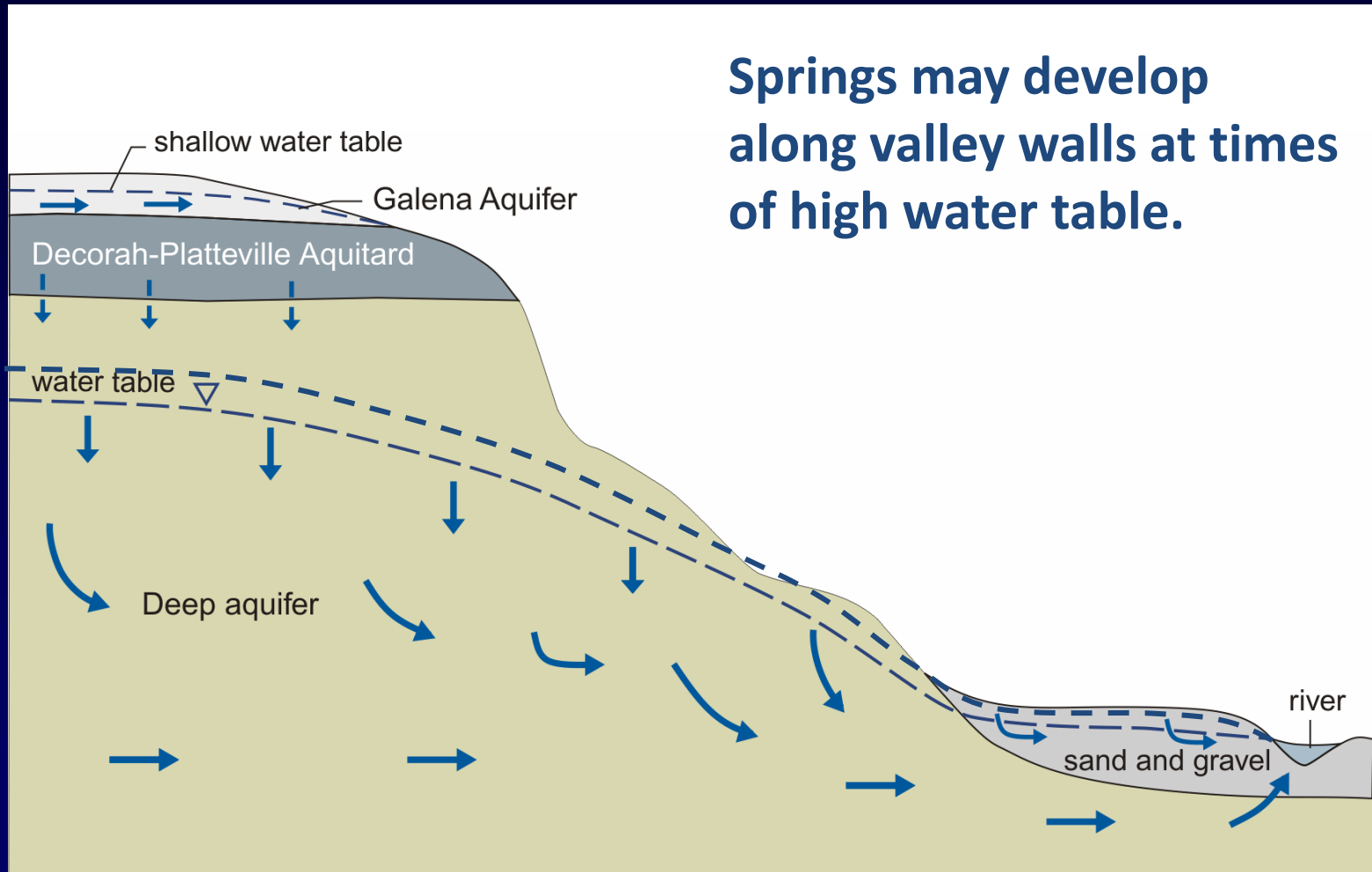


Stephens Falls, Governor Dodge

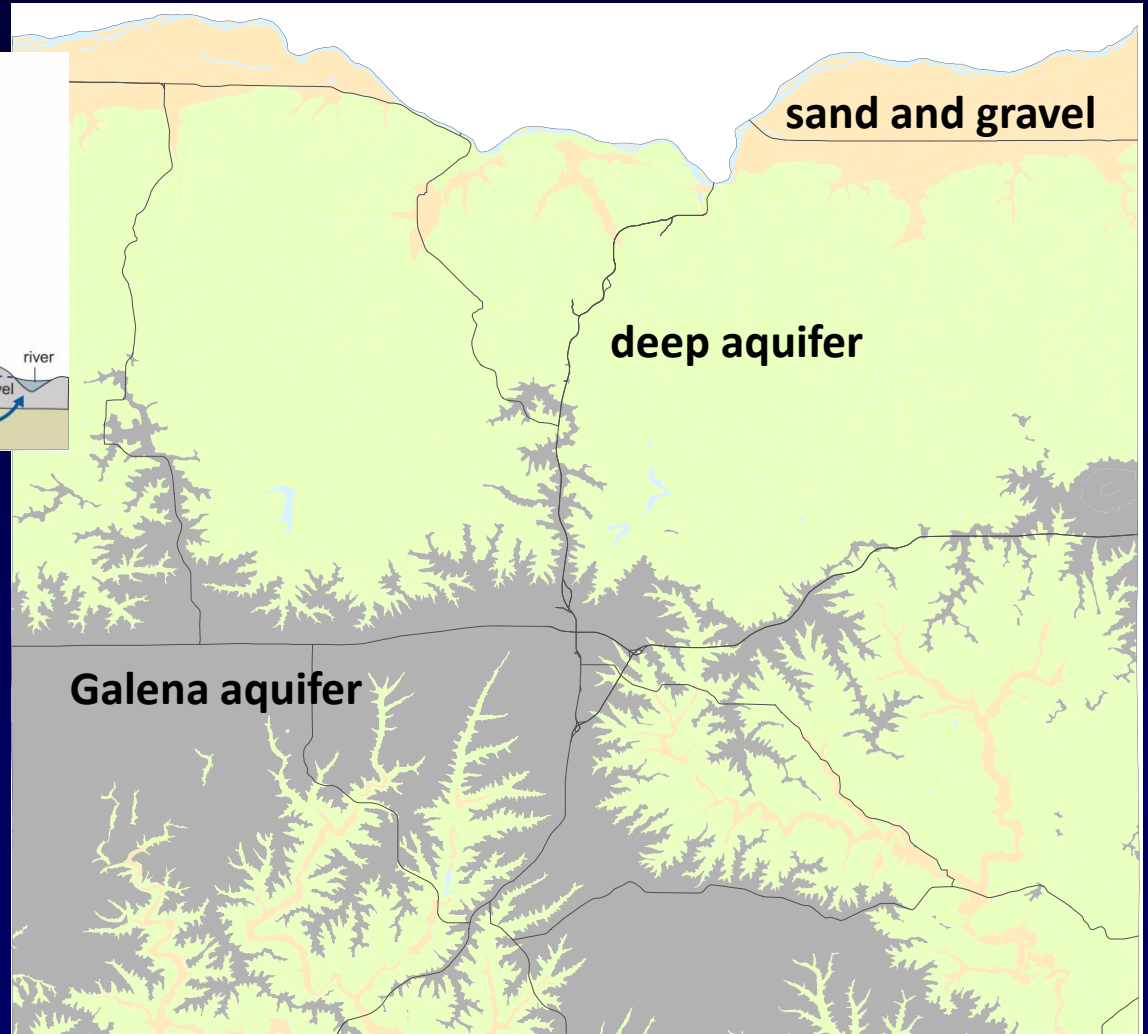
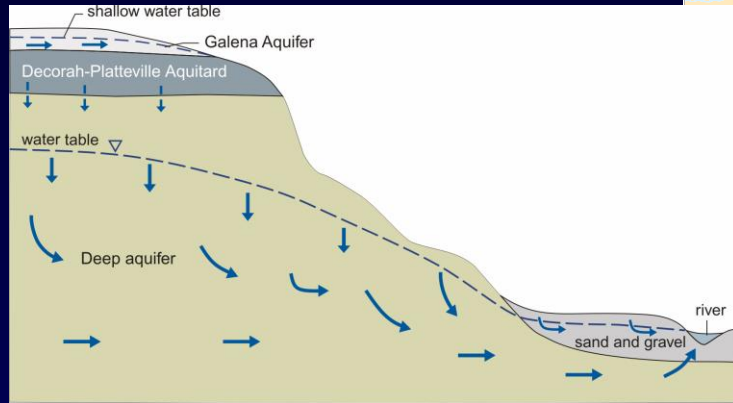


Big Spring, Iowa County

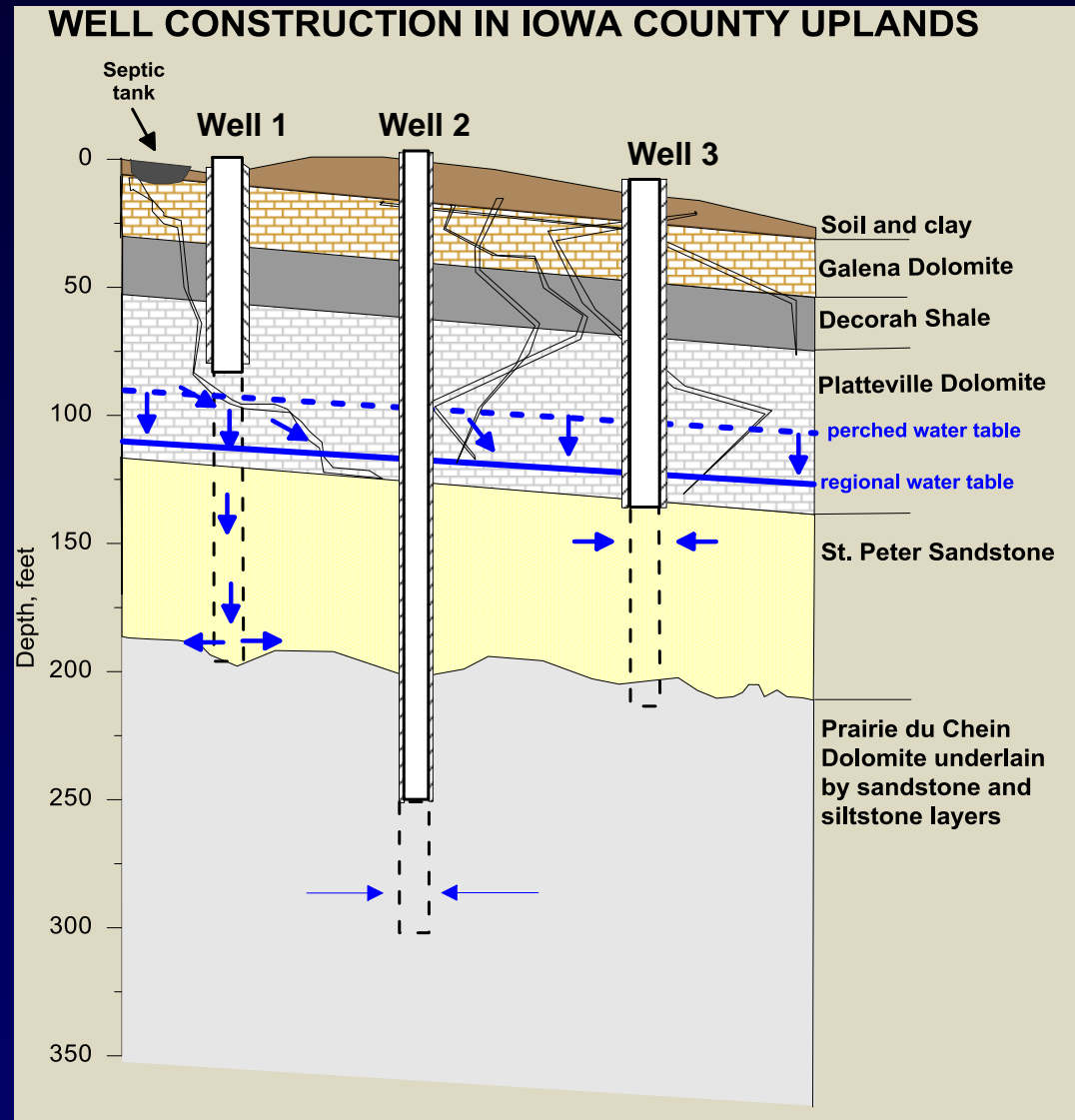
The Decorah-Platteville aquitard separates the shallow Galena aquifer from the deep aquifer.



There are three major aquifers in Iowa County.

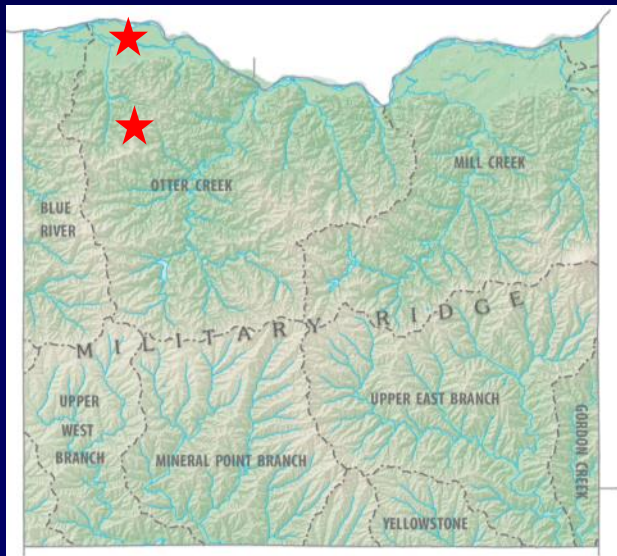


In upland areas, well construction MUST exceed state requirements for casing depth. Shallow cased wells are legal but make people sick.



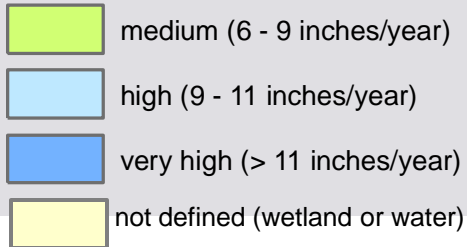
Groundwater flows from high to low elevations.

One use of the water table map is to identify where groundwater comes from that flows to a well or stream.



Groundwater recharge rates are high in Iowa County, due to permeable soil, and forest and agricultural land use.

**Infiltration,
in an average year**



**Does this mean
that there is an
unlimited supply
of water?**

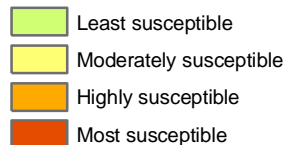
Groundwater in dolomite and limestone is vulnerable to contamination.



Caves, sinkholes and fractures are pathways for contaminants to quickly reach the water table. Deeply-cased wells provide some protection from such fractures.

Groundwater susceptibility to contamination

Susceptibility

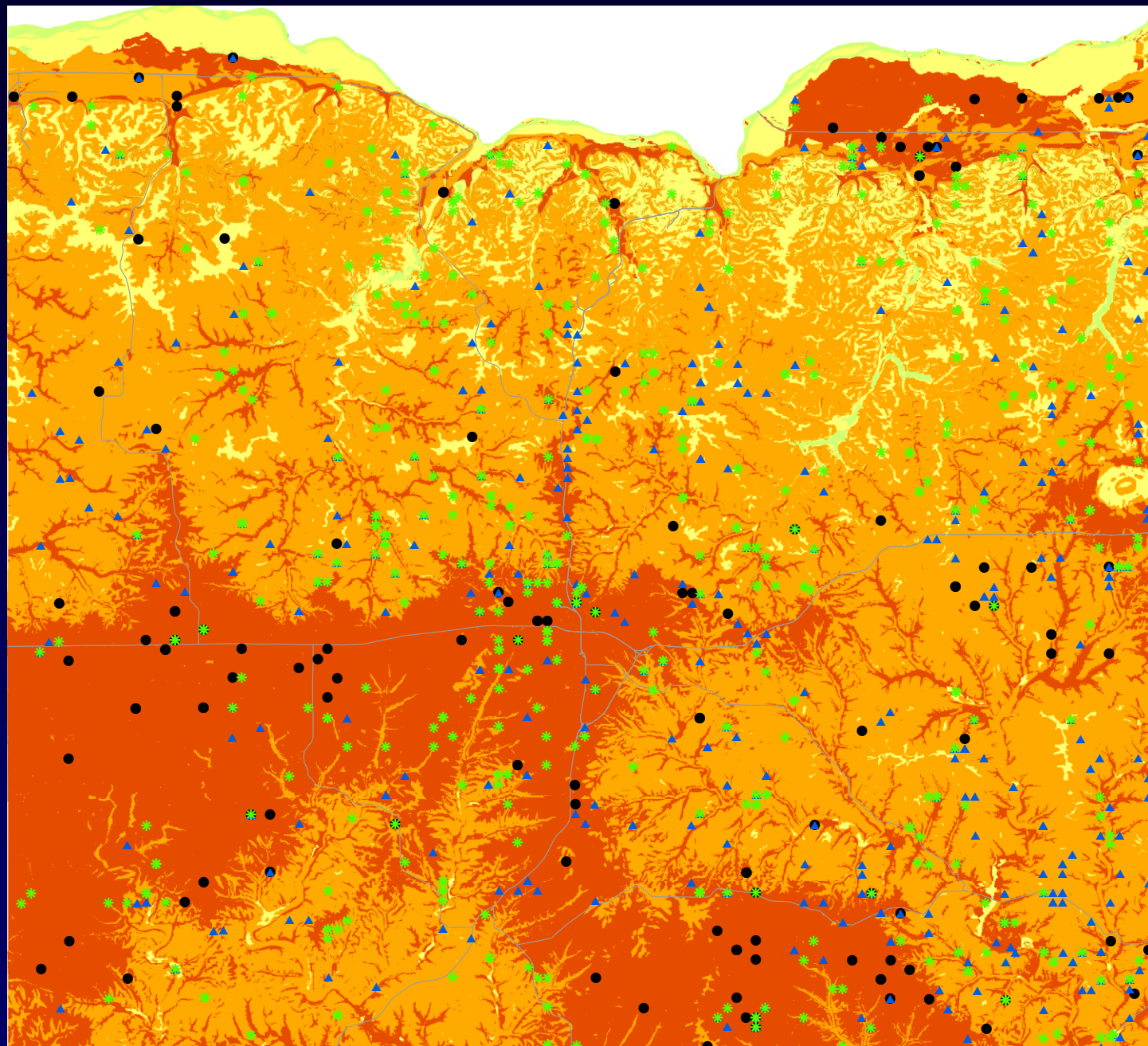


Nitrate, mg/L



Of 893 wells tested, 14 % exceed the drinking water standard for nitrate. 46 % exceed natural nitrate concentrations.

Data from Central Wisconsin Groundwater Center and UW Extension.



In summary, Iowa County's groundwater is abundant but very susceptible to contamination.

The unique geology results in two aquifers separated by an aquifer. This layered system gives rise to many springs and streams in Iowa County.



Questions?

The depth to water is shallow in valleys.

